



ACE Engineering College

(An Autonomous Institution)

Question Paper Code:

CE405PC

ACE-R20

Semester End Examination II B. Tech- II Semester- AUGUST/SEPTEMBER -2022 HYDRAULICS AND HYDRAULIC MACHINERY CIVIL ENGINEERING

Time: 3 Hours

Max. Marks: 70

H. T. No

Answer any 5 Questions out of 8 Questions from the following

Q.No	Question	Marks
1. a)	Show that the hydraulic mean depth of a trapezoidal channel having the best proportion is half of the minimum depth.	7
b)	Calculate the discharge of water in such a channel having semicircular bottom of 3m diameter and two sides as vertical when the depth of flow is 2.7m. Take Chezy's constant equal to 60 and the slope of the bed is 1 in 2000.	7
2.	A 3.6m wide rectangular channel conveys $9.0 \text{ m}^3/\text{s}$ of water with a velocity of 6m/s. Is there a condition for hydraulic jump to occur? If so, calculate the height, length and strength of the jump.	14
3.	Determine the discharge through a trapezoidal channel of width of 8m and side slopes of 1 horizontal to 3 vertical. The depth of flow of water is 2.4m and the slope of the bed is 1 in 4000. Take Chezy's constant $C = 60$.	14
4. a)	Derive an expression for loss of energy head for a hydraulic jump.	7
b)	Explain the different water surface profiles.	7
5.	A jet of water moving at 12 m/s impinges on a concave shaped vane to deflect the jet through 120° when stationary. If the vane is moving at 5m/s, find the angle of jet so that there is no shock at inlet. Also compute the absolute velocity of jet at exit both in magnitude and direction. Assume that the vane is smooth.	14
6.	A Kaplan turbine produces 60000kw under a net head of 25m with an overall efficiency of 90% taking the value of speed ratio K_u as 1.6, flow ratio 'x' as 0.5, and the hub diameter as 0.35 times the outer diameter find the diameter and speed of the turbine. Hydraulic efficiency=95% find i) mechanical efficiency (ii) overall efficiency (iii) vane angles at inlet and outlet	14
7. a)	What is governing and how it is accomplished for different types of water turbines?	7
b)	What is cavitation? How can it be avoided in reaction turbines?	7
8.	A centrifugal pump is delivering $0.216 \text{ m}^3/\text{s}$ of water against a head of 18m, the speed of rotation of impeller being 600 rpm. The diameters at outer and inner periphery of the impeller are 600 mm and 300 mm respectively. The area of flow is constant at 0.084 m^2 from inlet to outlet of impeller. If the vanes of the impeller are bent at an angle of 35° to the tangent at the exit. Determine Manometric efficiency, Inlet vane angle, Loss of head at inlet to impeller when the discharge is reduced by 35 %.	14